

Some reproductive traits of female Nubian goats

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Abstract: Two experiments were designed to explore some of the reproductive traits of Nubian goats bred in Khartoum. Experiment I was designed to assess the pubertal age, body weight and progesterone concentration (P₄ conc.) of the luteal phase of the first pubertal oestrus. Fourteen Nubian doelings at the age of 3 months and weighing 8-10 kg were used. The results showed that Nubian doelings attain puberty at the age of 264.93 ± 16.47 days and mean body weight of 16.79 ± 0.59 kg and their mean serum P₄ conc. during the luteal phase of the first pubertal oestrus is 3.07 ± 0.62 ng/ml. Experiment II assessed the length of the postpartum period (p.p), open period, gestation period, kidding interval and the P₄ conc. during the luteal phase of the first postpartum oestrus. Fifty-two Nubian does, aging between 2 to 5 years were used to assess these parameters. The assessment showed that the mean length of p.p is 51.0 ± 4.5 days, the mean milk P₄ conc. during the luteal phase of the first postpartum oestrus is 3.20 ± 0.5 ng/ml and the mean lengths of the open period, gestation period, and kidding interval are 93.2 ± 4.6, 147.1 ± 0.8 and 240.3 ± 7.8 days respectively. The results of this study make a good base for the reproductive traits of Nubian goats in the Sudan to improve their reproductive efficiency.

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1. Introduction

The Sudan is endowed with several breeds of goats. Among these breeds is the Nubian goat breed, which is highly specialized in milk production (Hassan and Elderani, 1990). Nubian goats are among the best dairy goats in Africa (Devendra and Macleroy, 1982). The Nubian goats population is 2.5 millions out of 40 million head of goats in the Sudan (MAR, 2001). This breed plays a substantial economic role in the live hood of many families. Although the goat is the most prolific animal sometimes it has some degree of reproductive failure (Devendra and Burns, 1983). A thorough knowledge about the reproductive traits of Nubian goats is essential to overcome these reproductive problems. However, sparse information about the reproductive traits of Nubian goats is available (Elnaim, 1979; Ibrahim, 2000; Yagoub and Elsheikh, 2003; Elsheikh and Yagoub, 2006; Elsheikh et al., 2013). Recently there is a trend to improve Nubian goat production in the Sudan by crossing with Sannen goats (Elhammali et al., 2013). However, this can not be achieved unless their reproductive potentials be known and exploited.

Thus, the objective of the present study is to determine the age of puberty, body weight at puberty and P₄ conc. during the luteal phase of the first pubertal oestrus. Furthermore, the lengths of the postpartum period p.p, open period, gestation period, kidding interval and the P₄ conc. during the luteal

phase of the first postpartum oestrus were also determined.

2- Materials and methods

2.1. Animals

This study was carried out in Kuku goat improvement farm in Khartoum North in Sudan (Latitude 15° 36' N, Longitude 32° 32' E). A total of 66 Nubian goats (14 doelings, 52 does) from a single flock were used in this study.

2.2. Husbandry and management. The animals were kept in open side-sheds. The roof was three meters above the floor. The animals were fed 250-750 g of concentrate made at the farm and composed of 33% groundnut cakes, 33% sorghum (*Sorghum vulgare*, vr. Fetarita), 33% wheat bran and 1% sodium chloride (according to age and production) and were offered Alfa alfa ad libitum. The animals were allowed to exercise and graze once a week in adjacent pasture. The goats were injected against ento- and endoparasites with 1ml/50 kg ivermectin (Ivomec®, Merial Company, France).

2.3. Serum sampling

Evacuated tubes with no anticoagulant were used to collect blood samples. Ten milliliters of blood were collected from the jugular veins of the doelings every 10 days. The blood samples were allowed to clot and were centrifuged, within 4 hours at approximately 2500 g for 15 minutes, to separate the serum. The separated serum was kept frozen at -20°C.

2.4. Milk sampling

Ten milliliters of whole milk were collected from postpartum Nubian goats every 10 days in milk sample vials. Each 10 ml of the whole milk was preserved by adding one tablet (100 mg) of sodium azide. The preserved milk was centrifuged at 2500 g for 15 minutes at room temperature. The centrifuged milk was separated into fat layer and skim milk. The separated milk was placed in a refrigerator for 15 minutes to harden the fat layer. A glass rod was used to pierce the fat layer and the entire skim milk was transferred by Pasteur pipette to storage vials. The skim milk samples were kept at 4°C or kept frozen until used.

2.5. Oestrous detection

Bucks with excellent libido and of known fertility were joined to the does and doelings. Trained personnel observed the signs of oestrus thrice a day for 30 minutes (7:00, 13:00, and 19:00). The doe or the doeling was considered in oestrus when it showed overt oestrous signs, wagging its tail, bleating, mounting others and/or allowed the bucks or other goats to mount her (Mackenzie, 1967). Furthermore, the occurrence of oestrus is confirmed by measuring milk P₄ conc. If the overt oestrous signs were not expressed, ovulation was assumed to have occurred 4 days before the first time the milk or serum P₄ values were greater than 0.3 ng/ml and 0.5 ng/ml respectively (Mavrogenis, 1987).

2.6. Progesterone assay

The P₄ in the milk was assayed according to FAO/IAEA progesterone RIA protocol version 3.1 (1996). The detection limit (minimal detectable dose) of this assay is approximately 0.02 ng/ml.

2.7. Detection of conception

The doe was considered pregnant when it does not show oestrus after mating (Mackenzie, 1967). Pregnancy was confirmed by milk P₄ assay. Goats that showed an increasing milk P₄ conc. (>3ng/ml) were considered pregnant.

3- Experimental procedures

Experiment I:

This experiment was carried out to determine the age of puberty, body weight at puberty and P₄ conc. during the luteal phase of the first pubertal oestrus in Nubian doelings. Fourteen pure Nubian doelings were employed in this experiment. Their body weights were 8-10 kgs and their age was 3 months at the time of use. Body weights were measured every 10 days. The P₄ in the serum was assayed as described above. The doeling that showed overt oestrous signs and/or serum P₄ conc. of 1 ng/ml or more was considered at puberty. If the animal did not show overt oestrous signs, ovulation was assumed to have occurred 4 days before the first time the serum P₄ values were equal or greater than 0.5 ng/ml (Mavrogenis, 1987).

Experiment II

This experiment was designed to determine the length of the p.p, open period, gestation period, kidding interval and the P₄ conc. during the luteal phase of the first postpartum oestrus in Nubian goats. Fifty-two Nubian does, aging between 2 to 5 years were used to determine the length of p.p and P₄ conc. To determine the length of the open period, gestation period, and kidding interval; 10 does that conceived after p.p were employed. The recrudescence of the first postpartum oestrus was detected as described in the methods.

4- Statistical analysis

Data are presented as means ± standard error of the mean (SE).

5- Results

Experiment I

As shown in table I, Nubian doelings attain puberty at a mean age of 264.93 ± 16.47 days and mean body weight of 16.79 ± 0.59 kg. Moreover, their mean P₄ conc. during the luteal phase of first oestrus was 3.07 ± 0.62 ng/ml.

Experiment II

As shown in table 2, the mean length of p.p. in Nubian goats is 51.0 ± 4.5 days (range of 21-112 days) and the mean milk P₄ conc. during the luteal phase of the first postpartum oestrus is 3.20 ± 0.5 ng/ml (minimum 1 ng/ml, maximum 12.58 ng/ml). The mean lengths of open period, gestation period and kidding interval were 93.2 ± 4.6, 147.1 ± 0.8 and 240.3 ± 7.8 days, respectively (table 3).

6-Discussion

Goat breeds vary in their age of puberty. Boer doelings reached puberty at the age of 157.2 days (Greyling, 1990), Black Bengal attained puberty at 196.5 days, Angora at 240 days and Sannen at 210 days (Bhattacharyya et al., 1984, Amoah and Bryant, 1984, Devesons, et al. 1992). Hebsi and Zomori goats, native to Saudi Arabia reached puberty at the age of 366 ± 1.7 days and 374 ± 2 days, respectively (Alhozab and Basiouni, 1999). Nubian doelings in the present study attained puberty at an age (264.93 ± 16.47 days) higher than that reported for Boer, Black Bengal and Sannen goats. However, Nubian doelings age of puberty is less than that of Hebsi and Zomori goats. From the present study also we found that the mean of the body weights of Nubian doelings at puberty (16.79 ± 0.59 kg) is lower than those reported for Boer goats, 30.6 kg, Creole goats, 24 kg and Sannen, 30.0 kg (Greyling, 2000, Delgadillo and Malpau, 1996, Amoah and Bryant, 1984, respectively). The results agree with our previous findings (Yagoub and Elsheikh 2003). The serum P₄ conc. at puberty in Hebsi and Zomori was reported to be more than 2 ng/ml (Alhozab and

Basiouni, 1999). The puberty serum P₄ conc. of the Nubian doelings was above 1 ng/ml.

Goat breeds vary in their length of p.p. in (Riera, 1982). The time taken for the recrudescence of the first oestrus postpartum in Boer goats was reported to be 55 ± 24.9 days (Greyling, 2000), whereas Creole goats take 21 days to return to oestrus postpartum (Chimaneu, 1983). Our findings in the present study showed that the mean length of the p.p. in Nubian goats (51.0 ± 4.5) is higher than that of Creole goats and nearly similar to that of Boer goats. Ibrahim (2000) observed a p.p. between 60 days and 120 days in Nubian goats in the Sudan. In the present study we found that the maximum length of the p.p. is 112 days and the minimum is 21 days. Our results are more accurate than the result of Ibrahim since there is no chance to miss a silent heat in our heat detection system. In this study recrudescence of oestrous cycle was done by both observation and RIA technique.

The mean length of the gestation period of Nubian does (147.1 ± 0.8 days) is almost similar to that of Boer goats (148.2 ± 3.7 days), whereas the length of the open period (93.2 ± 4.6 days) and the length of kidding interval (240.3 ± 7.8 days) are longer than the length of open period and kidding interval (62.0 ± 20.2 and 210 days, respectively) in Boer goats (Greyling, 2000). The values of these parameters are in agreement with our previous findings (Elsheikh and Yagoub 2006).

In conclusion, Nubian doelings attain puberty at the age of 264.93 ± 16.47 days at a mean body weight of 16.79 ± 0.59 kg and their mean serum P₄ conc. during the luteal phase of the first pubertal oestrus is 3.07 ± 0.62 ng/ml. Moreover, the mean length of postpartum period in Nubian goats is 51.0 ± 4.5 days, their mean milk P₄ conc. during the luteal phase of the first postpartum oestrus is 3.20 ± 0.5 ng/ml and the mean lengths of their open period, gestation period, and kidding interval are 93.2 ± 4.6, 147.1 ± 0.8 and 240.3 ± 7.8 days, respectively.

Table 1. Age, body weight and progesterone concentration at puberty in Nubian goats.

Case no.	Age of puberty (day)s	Body weight (kg)	Progesterone concentration (ng/ml)
1	168	16	3.07
2	231	18	1.19
3	220	19	5.90
4	290	16	4.17
5	226	17	6.89
6	208	14	6.34
7	213	14	1.80
8	341	17	1.24
9	253	21	1.48
10	318	19	1.24
11	312	18	1.77
12	322	18	0.88
13	196	14	6.14
14	311	14	0.92
Mean ± SE	264.93±16.47	16.79±0.59	3.07±0.62

Table 2. The length of postpartum period and P₄ conc. during the luteal phase of the first postpartum oestrus in Nubian goats.

Cases no.	Postpartum period in days	P 4 conc. (ng/ml)	Case no.	Postpartum period in days	P 4 conc. (ng/ml)
1	20	1.83	30	55	1.01
2	22	1.07	31	55	5.02
3	23	2.16	32	55	2.48
4	23	1.32	33	55	3.67
5	24	3.30	34	58	1.00
6	27	3.04	35	59	3.50
7	27	1.77	36	59	5.02
8	28	1.60	37	60	1.35
9	31	2.33	38	60	1.57

10	32	1.59	39	60	1.83
11	32	1.64	40	60	1.83
12	32	1.49	41	61	1.00
13	32	8.95	42	65	12.05
14	33	6.02	43	65	3.71
15	34	2.14	44	66	1.64
16	35	2.28	45	73	1.70
17	38	1.81	46	73	12.58
18	44	1.63	47	76	7.71
19	46	2.27	48	76	3.00
20	47	12.57	49	82	7.18
21	50	1.37	50	92	5.52
22	50	12.58	51	112	1.18
23	50	5.02	52	50	2.15
25	53	1.00	Mean \pm SE	51.0 \pm 4.5	3.20 \pm 0.5
26	55	8.87			
27	54	1.52			
28	54	1.70			
29	55	7.37			

Table 3. Lengths of open period, gestation period and kidding interval in Nubian does.

Case number	Open period (days)	Gestation period (days)	Kidding interval (days)
1	119	146	265
2	92	147	239
3	90	145	235
4	99	152	251
5	112	148	260
6	91	144	235
7	97	149	246
8	71	148	219
9	79	144	223
10	82	148	230
Mean \pm SE	93.2 \pm 4.6	147.1 \pm 0.8	240.3 \pm 4.8

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